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Residents' preferences for cultural services of the landscape along the urban–rural gradient

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ABSTRACT

Cultural services of the landscape contribute to a higher quality of life. The provision of these services differs along the urban–rural gradient, as does their appreciation by local residents. This paper investigates residents' preferences for cultural services along the urban–rural gradient through a map-based survey in and around the Dutch city of Maastricht. We focus on the importance of location in explaining these preferences, distinguishing the location of residents (relative to the preferred landscape units) and the location of landscape units (relative to their positions on the urban–rural gradient). The study shows that residents prefer nearby locations for all distinguished cultural services. Locations' valuation along the urban–rural gradient, however, differs by service type: for cultural heritage locations near the city centre are preferred, while outdoor recreation and sports and passive enjoyment of green landscapes are enjoyed more in rural areas. When considering the spatial distribution of the land-use types that provide these services, we further find that people prefer green areas closer to the city for outdoor recreation and sports and passive enjoyment of green landscapes. The results illustrate the heterogeneity of people's preferences for cultural services along the urban–rural gradient beyond the distance from their residences. We recommend policy makers to take the urban–rural gradient into account when valuating landscape units, and in particularly the importance of green landscape units close to the city for different cultural services.

1. Introduction

Landscapes are spatial human-ecological systems that support a multitude of functions that can be valued by people for economic, sociocultural and ecological reasons (de Fries et al., 2004). The direct and indirect contributions to human wellbeing and welfare derived from these landscapes are generally described as landscape services (Termorshuizen and Opdam, 2009). The concept of 'landscape services' differs from the more general term 'ecosystem services' in its emphasis on pattern-process relationships. As a man-made construct, landscape services more closely link to the practice of integrated landscape planning, policymaking and developing financing instruments (de Groot et al., 2010; Termorshuizen and Opdam, 2009). Landscape services can be categorised into three main groups: provisioning, regulation and maintenance, and cultural services according to the well-known Common International Classification of Ecosystem Services (CICES) by Haines-Young and Potschin (2010). Examples of such services include the growth of food and materials, providing regulation against hazards, and facilitating recreational activities (Vallés-Planells et al., 2014). These cultural services are particularly important because they significantly contribute to both a person's physical and spiritual wellbeing, for example through facilitating relaxation, outdoor activities, spiritual enrichment, recreation and natural and cultural education (Gulickx et al., 2013; Willemen et al., 2012).

Yet, the mapping and valuation of cultural services has received less attention than that of provision and regulation services (Feld et al., 2009; Plieninger et al., 2013; Vallés-Planells et al., 2014). Our study aims to partly fill this void and contribute towards a better understanding of the public appreciation of landscapes for the provision of cultural services. In doing so we build on recent literature that analysed people's preferences for landscape units for their provision of specific landscape services (Plieninger et al., 2013; Swetnam et al., 2011; Zoderer et al., 2016). We follow their land-use based delineation of landscape units as the basic elements for service provision and share their emphasis on obtaining, mapping and explaining public perceptions of the cultural services provided by the landscape using a GIS and statistics-based approach. Giving attention to the social and spatial context in which the landscape provides its services is crucial for understanding how valuable these services are to the general public (Vallés-Planells et al., 2014), and essential if we want to move beyond a

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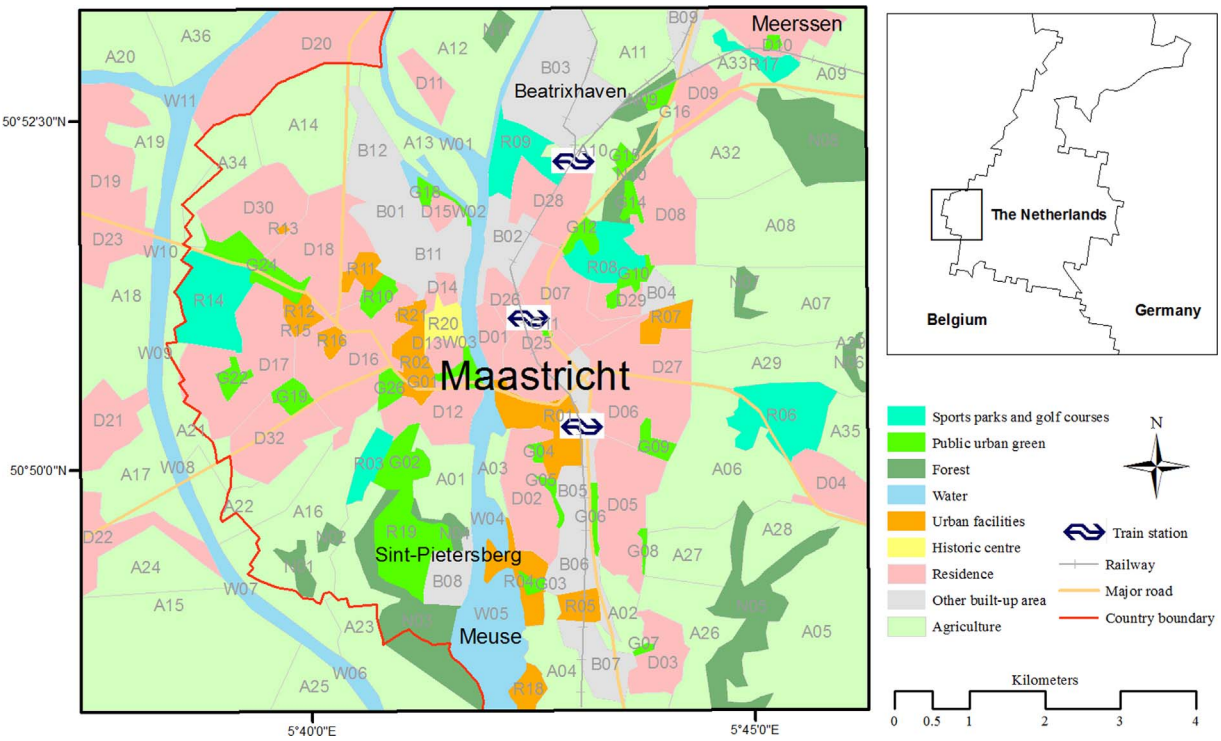

Fig. 1. Study area with the distinguished landscape units and the codes used in the survey.

mechanistic, biophysical quantification of the supply of services that is common to many studies that applies value transfer methods to map the services supplied by the landscape.

In our approach we include two new aspects that we consider important for understanding public preferences for landscape units. First, we explicitly address the importance of the location of residents relative to locations of the landscape units that they may prefer in their surroundings, and second we include the position of these landscape units on the urban–rural gradient. We assume that spatial differences in the provision of services are likely to affect the way people value the landscape in their surroundings. These preferences will on the one hand be steered by the availability of services (you can only value what is present), but may on the other hand be influenced by scarcity, city parks in densely populated central areas may be more popular than larger open areas in more distant rural areas (see, for example, Geoghegan et al., 1997; Sander and Haight, 2012). In addition, the appreciation for landscape units such as recreational forests is known to decrease with increasing travel distance (Cheung and Jim, 2013; Hörnsten and Fredman, 2000; Li et al., 2016), as is generally the case with people's preferences for environmental or public goods (Hanley et al., 2003; Pate and Loomis, 1997).

To characterise spatial variation in the provision of landscape services we partly rely on the urban–rural gradient concept that characterises the transition from built-up to more open and natural landscapes (McDonnell and Pickett, 2013). This gradient renders a schematic depiction of the relative abundance of different types of services: food and water supply, aesthetic services and spiritual services are typically found to be more prominent at the rural end of the gradient where agricultural and natural land-use types are more prominent (Kroll et al., 2012; Łowicki and Walz, 2015; Radford and James, 2013). Yet other services such as water flow regulation, pollination potential and recreation do not show such clear trends as was, for example, documented in a study of the Greater Manchester region (Radford and James, 2013). A recent comparative study of four European cities also revealed that the provision of some landscape services (e.g. local climate regulation, air cooling) did not follow a typical urban–rural gradient, whereas others (such as recreation that was related to the presence of urban green areas) did show higher supply levels towards the rural end of the gradient (Larondelle and Haase, 2013). If anything, these studies indicate that the provision of landscape services differs across space depending on the type of service and local characteristics. Addressing the spatial distribution of the studied landscape units relative to the observer (representing the demand for services) and other landscape units (reflecting the supply of services) seems essential in studying the appreciation of cultural services.

To explore how the location of landscape unit matters for the appreciation of the cultural services they offer, we set up a map-based questionnaire asking local inhabitants to pinpoint their favourite places for enjoying a selection of services offered by the landscape. The study was performed in the Dutch city of Maastricht, which has an important historic centre and is situated in a diverse and attractive cultural landscape. The region clearly exemplifies that urbanised environments also offer cultural services as was previously demonstrated by others (e.g. Bertram and Rehdanz, 2014; Derkzen et al., 2015; Haase et al., 2014). Some services (e.g. recreation and education services) are considered to be even more important in urban landscapes than in agricultural or rural landscapes (Haines-Young and Potschin, 2008), especially in areas with high population density (Wu et al., 2013).

2. Methods

2.1. Study region

The study was performed in and around the city of Maastricht, located in the province of Limburg at the southern tip of the Netherlands. The city is attractive for its rich history, having the second-highest number of national monuments in the country.[1] The city has been inhabited continuously since the Roman era when it was a small settlement next to a bridge crossing the river Meuse (Cillekens and Dijkman,

[1] Maastricht has 1681 monuments. This is much less than Amsterdam (7504), but more than number three Utrecht (1439). Source: http://rijksmonumenten.nl (last Accessed 7 November 2017).

2006). In addition, the elevation difference which ranges from around 50 m above sea level near the river to 170 m at the top of the partly excavated mount Sint-Pietersberg make it special to Dutch residents, as it is different from the generally flat landscape in the Netherlands (van Heerd et al., 2000). The varied landscape and topography provide many outdoor sports and leisure opportunities. This popular holiday and recreation destination is appreciated by local residents, with all kinds of museums, churches, scenic spots and historic sites, golf courses, amusement parks, and water facilities.

The study region consists of a 10 km by 10 km rectangle centred on the historic centre of Maastricht (Vrijthof square and its adjacent medieval core) and includes a small part of Belgium, as Fig. 1 shows. It is a mixed area consisting of 46% agricultural land use, 36% built-up areas, approximately 13% green open space, and 5% water bodies. The population in the Dutch part of the study area totalled about 130,000 in 2015 (CBS, 2015).

2.2. Study design

In our study, we focus on the appreciation of a subset of cultural services provided by the landscape that can be recognised by local residents. So rather than first explaining the concept of cultural services and describing the different types of services provided by the landscape as is common in many other studies on the perception of cultural services (Plieninger et al., 2013; Zoderer et al., 2016), we prefer to select a number of easy to recognise services. This approach has the drawback that we could not question respondents on a large number of potential services, but it offers the advantage that our questionnaire could be handled in about one minute. As a result we have a fairly large sample of non-expert preferences that is quite representative of the local population. We selected services from the classification of CICES (Haines-Young and Potschin, 2010) and subsequently proposed additions (Vallés-Planells et al., 2014) that are expected to be particularly relevant to the study region, which has an abundance of historic monuments and an attractive landscape: cultural heritage, outdoor recreation and sports, and passive enjoyment of green landscapes. The three selected cultural services aim to represent the most important and easy to recognise cultural services that are appreciated by different types of residents. Cultural heritage is an asset that many Dutch inhabitants value highly in the cities in which they live (van Leeuwen et al., 2013), and its importance to the residents is reflected in the attention that it receives in regional spatial policy plans (Willemen et al., 2012). Outdoor recreation and sports reflect the more active type of landscape enjoyment (Haines-Young and Potschin, 2010), while passive enjoyment is the term Vallés-Planells et al. (2014) introduced for aesthetic appreciation and other less tiring activities (e.g. seeing wildlife) people visit landscapes for. These services are also highlighted by several multidisciplinary experts and professionals as having a high priority in terms of conservation and improvement (Andersson et al., 2015; Radford and James, 2013).

To capture the appreciation of local residents for these three cultural services our research applies a combination of mapping and interview techniques. A concise paper map based questionnaire has been developed to ask local residents to pinpoint their favourite place for each of the three cultural services within the study area and to provide some basic personal information (see Appendix A in Supplementary Material). Because the passive enjoyment of green landscapes may be difficult for respondents to understand, we asked them in a more direct way to point out their favourite place for enjoying agricultural and green landscapes. In addition, the most disliked place to visit is requested for comparison. Subsequently, the preferences of the respondents are integrated into a standard desktop geographical information system (ArcGIS 10.4.1) to map the residents' preference for cultural services along the urban–rural gradient and calculate the distances for statistical analysis (Sherrouse et al., 2011). Then a conditional logit model is employed to estimate the probability of a landscape unit being liked.

2.3. Mapping landscape services

In line with other recent studies that mapped and assessed cultural services (Plieninger et al., 2013; Zoderer et al., 2016), we use homogeneous land-use patches as the units of analysis in our study. The land-use map was a central element in the questionnaire we developed to unravel the preferred locations for specific landscape services. To capture the spatial preference of local residents, we asked them to indicate on the map which locations they preferred most for specific activities (Fig. 1). Because we only approached local residents, we assumed that they are familiar with the study area. We decided not to use a photo or sketch-based approach (as applied by, for example, Arriaza et al. (2004) and Sherren et al. (2010)), as these are time consuming to set up, provide a less complete coverage over the whole study area and may pose a larger risk of misrepresenting specific aspects. The face-to-face interview approach is employed in our study due to its higher response rate and real-time reply compared with using, for example, internet- or phone-based questionnaires.

A land-use data set was used to define landscape units in the region, as this spatial representation of landscape variation presents elements that are recognizable in size and appearance to non-professionals (de Vries et al., 2007; Nemec and Raudsepp-Hearne, 2013). More detailed data sets, such as topographic maps or domain-specific landscape maps (e.g. derived from landscape ecology or historic geography) provide landscape characteristics that we considered to be less easily recognised by the local residents whom we interviewed. The land-use based definition of landscape characteristics also allowed us to correct our analysis of spatial aspects in landscape appreciation for biases towards specific land-use types (water, natural vegetation) that were documented in earlier Dutch research on landscape preferences (e.g. Heijman and Goossen, 2009; Roos-Klein Lankhorst et al., 2002).

The landscape units are based on a combination of the 2010 land-use map from Statistics Netherlands for the Dutch part of the study area (CBS, 2010) and the Corine land cover 2006 map for the Belgian part (EEA, 2006). We aggregated over 40 different land-use types in the study region, based on their relevance to our three cultural services, into nine major types of use: (1) sports parks and golf courses; (2) public urban green (day recreation sites, cemeteries, parks, and public gardens); (3) forests; (4) water; (5) urban facilities (public facilities, socio-cultural facilities, retail and catering establishments, day trip locations, and accommodation); (6) historic centre; (7) residences; (8) other built-up areas (e.g. business estates, construction sites, and infrastructure); and (9) agriculture. Important landmarks (such as railway stations) and toponyms were added to the resulting map to make it more recognizable to the respondents. To provide our analysis with a higher spatial resolution, relatively large homogeneous units were further divided into smaller units by following natural or man-made boundaries (such as small rivers and roads). In total we distinguished 139 units with an average size of approximately 0.7 km^2 (Fig. 1).

2.4. Data collection

To improve our questions and make the survey map more recognizable to respondents, the survey was piloted and pre-tested in the city of Kampen and the Amstelland region (near Amsterdam) with bachelor's students in June and August 2014. As interviewing sites, we selected popular meeting places, such as schools, shopping malls, and supermarkets in the city centre and south part of Maastricht, as well as the village of Meerssen in the northeast (Fig. 1). These locations were selected to provide sufficient spatial variation in the origin of the residents. With the optimized questionnaire and survey map, the formal survey was conducted in Maastricht over five days in June 2015.

First, we introduced the respondents to our study purpose, after which we asked them to pinpoint their favourite landscape unit for

Table 1
Personal characteristics of the respondents in our sample compared with the official statistics for the city of Maastricht in 2015 (CBS, 2010).

Characteristic	Sample%	Regional statistics%
Age		
< 20	18	18
20–29	16	20
30–39	9	10
40–49	14	12
50–59	12	14
> 60	31	26
Gender		
Male	41	48
Female	59	52
Education		
Low	31	32
Middle	25	37
High	44	32

N = 242 for age and gender; the response rate for education was lower (N = 169), and this characteristic was therefore excluded from further analysis.
Education level: Low refers to primary or secondary education as the highest obtained education level; middle to vocational education; and high to higher professional or university education. Respondents with an unknown education level are excluded from these statistics. The shares may not add up to exactly 100% due to the rounding of values.

enjoying (1) cultural heritage, (2) outdoor recreation and sports, and (3) passive enjoyment of green landscapes as well as to highlight the place that they disliked most to visit. The corresponding number of the (non-) preferred landscape unit was recorded for each respondent in combination with basic personal characteristics regarding age, gender, education, and postcode of residence (as the education information was not provided for about one-third of the observations, this aspect is excluded from the analysis in the subsequent conditional logit model). In total, 242 respondents provided complete and valid responses. In addition, the population structure of the valid sample is comparable to that of the local total population (Table 1). The age group over 60 years old had the largest share (31%), while the group aged 30–39 held the smallest share (9%). The other groups had similar proportions. The sample had a slight overrepresentation of females (59%) and high education levels (44% compared to 32% in the region, see Table 1 for more details).

2.5. Data analysis

2.5.1. Spatial analysis

Two spatial characteristics were obtained with ArcGIS for the landscape units that were selected by each respondent: (1) the residential distance, based on the six-digit zip code coordinates of the resident's address and the geometric centroid of the landscape unit selected by this resident; and (2) the gradient distance, based on the distance from the centroids of the selected landscape units to the central square (Vrijthof) in Maastricht.

A schematic representation of these two types of distances is depicted in Fig. 2. From the spatial database with landscape units we could also calculate the size of each selected unit and its predominant land-use type. Ultimately, we documented for each of the 242 respondents their basic personal characteristics and the spatial and other characteristics of the four landscape units they selected for: the provision of cultural heritage; opportunities for outdoor recreation and sports; passive enjoyment of green landscapes; and most disliked place.

2.5.2. Econometric analysis

To analyse how the spatial differences in the provision of cultural services affect the way people value the landscape in their surroundings, we used a discrete choice approach. We particularly focus on the spatial characteristics of the alternatives (landscape units): residential distance, gradient distance as well as interaction variables of gradient distance and land-use type. Since we are in particular interested in the characteristics of the alternatives rather than those of the respondents, we applied a conditional logit model. In such a model, the choice among different alternatives is treated as a function of the characteristics of the alternatives themselves (Hoffman and Duncan, 1988). The more common multinomial logit model was not employed in our study, since it emphasises the features of the individual who makes the choice instead of the features of the choice option (alternative) (McFadden, 1974).

Our model can be formulated as follows. Suppose that U_{ij} in Eq. (1) represents the utility of alternative *j* to individual *i*. Then we treat them as independent random variables with a determinant part η_{ij} and a random component ε_{ij}. All the individuals are supposed to act in a rational way and to maximize their utility. Thus, alternative *j* is chosen when its associated utility is higher than that of all the other alternatives $q \neq j$ in the choice set C (Rambonilaza and Dachary-Bernard, 2007). The general discrete choice model can be expressed as:

$$U_{ij} > U_{iq}, \forall q \neq j \in C \Leftrightarrow (\eta_{ij} + \varepsilon_{ij}) > (\eta_{iq} + \varepsilon_{iq}) \quad (1)$$

When the distribution of ε_{ij} is assumed to have a Weibull form, the choice probability that individual *i* will choose alternative *j*, written as P_{ij}, can then be expressed with a conditional logit model:

$$P_{ij} = P(U_{ij} > U_{iq}) = \exp(\eta_{ij}) / \sum_{q=1}^{Q} \exp(\eta_{iq}) \quad (2)$$

Alternative choices are thus constructed by treating the preference for a selected landscape unit as the dependent variable. It is set to 1 if the area is selected as the most preferred unit for benefiting from a specific cultural service and otherwise to 0. To understand the general impact of distance on residents' preference for cultural services, we started with a basic model that explains the preferences for specific locations for offering any of the included cultural services based on the urban–rural gradient distance and residential distance of the landscape unit. The size of the landscape unit and its location in either the Netherlands or Belgium were treated as control variables (Eq. (3)). Furthermore, we extended the basic model to reveal the impact of the specific land-use type of the alternative and how its location along the urban–rural gradient affects the preference of the respondents. Each land-use type was hence defined as a dummy variable and then interacted with the gradient distance. Likewise, age and gender (interacted with the gradient distance) were introduced into the utility function to correct for personal differences between the respondents. Then the utility function for choosing alternative *j* for each cultural service *g* can be expressed as follows:

$$U_{ijg} = \alpha ResiDis + \beta GraDis + \gamma Size + \omega NL + \delta Land + \theta GraDis{*}Land + \lambda GraDis{*}Age + \mu GraDis{*}Gender + \eta GraDis{*}Urb + \varepsilon_{ijg} \quad (3)$$

where *ResiDis* and *GraDis* are the residential distance and the gradient distance, respectively. *Size* is the area (in km^2) of the preferred landscape unit. *NL* is a country dummy (with 1 referring to the Netherlands and 0 to neighbouring Belgium). *Land* represents each of our classified land-use types except *Residence*. *Residence* was selected as the reference group because it is more homogeneous in character and spatial distribution than the other types of land use. *GraDis*Land* are the interaction variables of the gradient distance intersected with the land-use type. The historic centre was not intersected with the gradient distance since it has no distribution along the urban–rural gradient. The interaction terms were used to estimate different gradient preferences for different land-use types and by different groups of respondents based on their age (*Age*), gender (*Gender*) and level of (residential) urbanity (*Urb*). This final variable has been included to control for sorting mechanisms according to which people choose to live in areas they generally prefer.

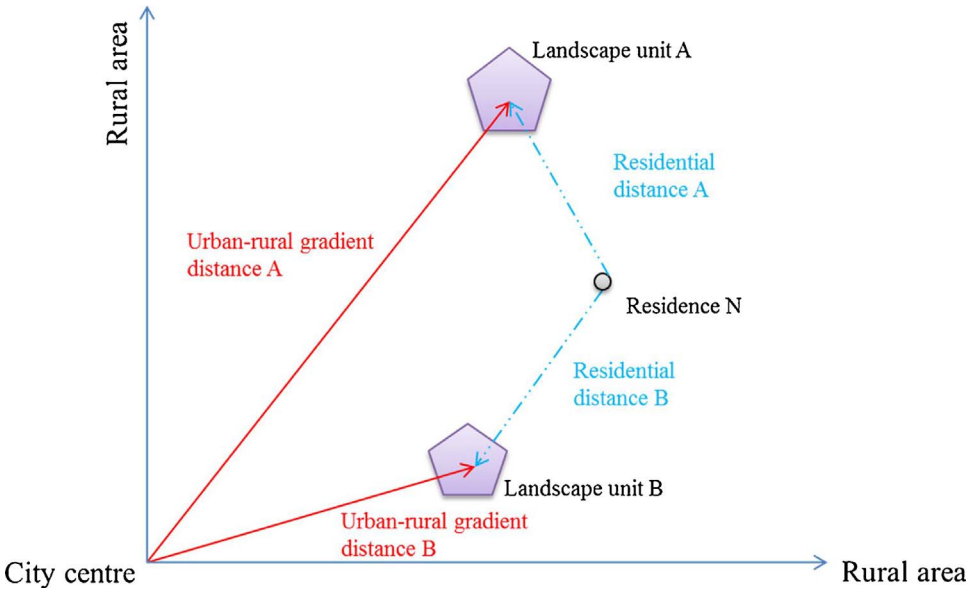

Fig. 2. Illustration of the concepts of urban–rural gradient distance and residential distance applied in our spatial analysis. This example shows the distance from residence N to two different landscape units preferred for landscape services A and B, respectively.

3. Results

3.1. Spatial distribution of residents' preference

The residential locations of the respondents and a summary of their responses are displayed in Fig. 3. Fig. 3A shows that the residents' locations are distributed fairly evenly throughout the study region. Generally the residents' preferences for cultural heritage are clustered around the urban district and some appreciated landscape units in the south, further away from the city centre (Fig. 3B). In contrast, the preferred units for outdoor recreation and sports and passive enjoyment of green landscapes are more dispersed along the urban–rural gradient, with a seeming concentration at the rural end (Fig. 3C, D).

The historic centre of Maastricht and its surrounding (historic) neighbourhoods are pinpointed with high frequencies for all three cultural services. At the same time, they are selected as the most disliked place to visit for general cultural services by some residents. Further away from the centre of Maastricht, the hotspots are gathered in the town of Meerssen in the northeast, the forest in the southeast, and Sint-Pietersberg in the south of the study area for all three cultural services. Some other (less) preferred units can be found in the northeast and southeast. The industrial units around Beatrixhaven in northern Maastricht are in particular more frequently chosen as the most disliked place to visit (accounting for 52% of the total selection frequencies, see Fig. 3E).

To gain a further understanding of the spatial distribution of the preferred landscape units along the urban–rural gradient, we divided the study region into ten concentric circles surrounding the centroid of the historic centre. Each ring has an equal distance interval of 0.5 km from the city centre. Then we calculated the number of preferences per km^2, which were then aggregated for each ring (Fig. 4). This figure shows that the central parts of the town are most frequently preferred for all the services. However, this area also contains the most frequently disliked landscape units. From about 1.5 km from the centre, the frequency of preferred sites per km^2 remains fairly constant along the gradient, with slight peaks in preferences for outdoor recreation and sports and passive enjoyment of green landscapes around 3–3.5 km (at the edge of Maastricht) and further than 5 km from the city centre in the most rural part of the study area. The frequency of most disliked landscapes shows peaks around 2 and 3.5 km from the city centre.

3.2. Land-use type and residents' preference

Next, we analyse how land-use type relates to preferences for the distinguished landscape (dis)services. The different types of land use are roughly ordered in Fig. 5 from the historic district in the centre (at left) to the rural end of the gradient. As in most heterogeneous landscapes, however, this distribution is more complex in reality (Fig. 6). From Fig. 5 we can see that outdoor recreation and sports and passive enjoyment of green landscapes are generally preferred in both urban and rural green areas such as forests, public urban green, and agricultural areas. Cultural heritage is most often enjoyed in the historic centre, as well as in residential areas. Water is the least preferred land-use type for all the services, and the most disliked places are found more in other built-up areas.

To compare the presence or supply of different land-use types along the urban–rural gradient with the frequency with which they are selected, we calculated the proportion of each land-use type in each ring (Fig. 6). The figure clearly depicts the increase in agriculture and decrease in residential land-use along the urban–rural gradient. Other types of land use do not show a clear trend along the gradient.

3.3. Factors influencing the preference

After having shown the spatial distribution of the preferences, this section will focus on the determinants of the preferences of the respondents, in particular the urban–rural gradient distance. Table 2 reveals the descriptive statistics for part of the landscape characteristics selected as the most (or least) preferred areas.

The results obtained by the basic and the extended conditional logit model are displayed in Table 3. The basic model, first of all, shows that the residential distance matters for both preferred and non-preferred services. The closer a landscape unit is to the home of the respondent, the more likely it is to be selected as a preferred location. Additionally, people have stronger feelings about larger areas: they are more often liked but also more often disliked. As for the gradient distance, we find that it poses different impacts on the preference for the three distinguished cultural services. The preference for cultural heritage decreases as the distance from the centre increases. Furthermore, the disliked areas are more often found near the city centre. On the other hand, the preferred areas for outdoor recreation and sports and passive enjoyment of green landscapes are more likely to be located at the rural end of the gradient.

The second part of Table 3 shows the results of the extended model

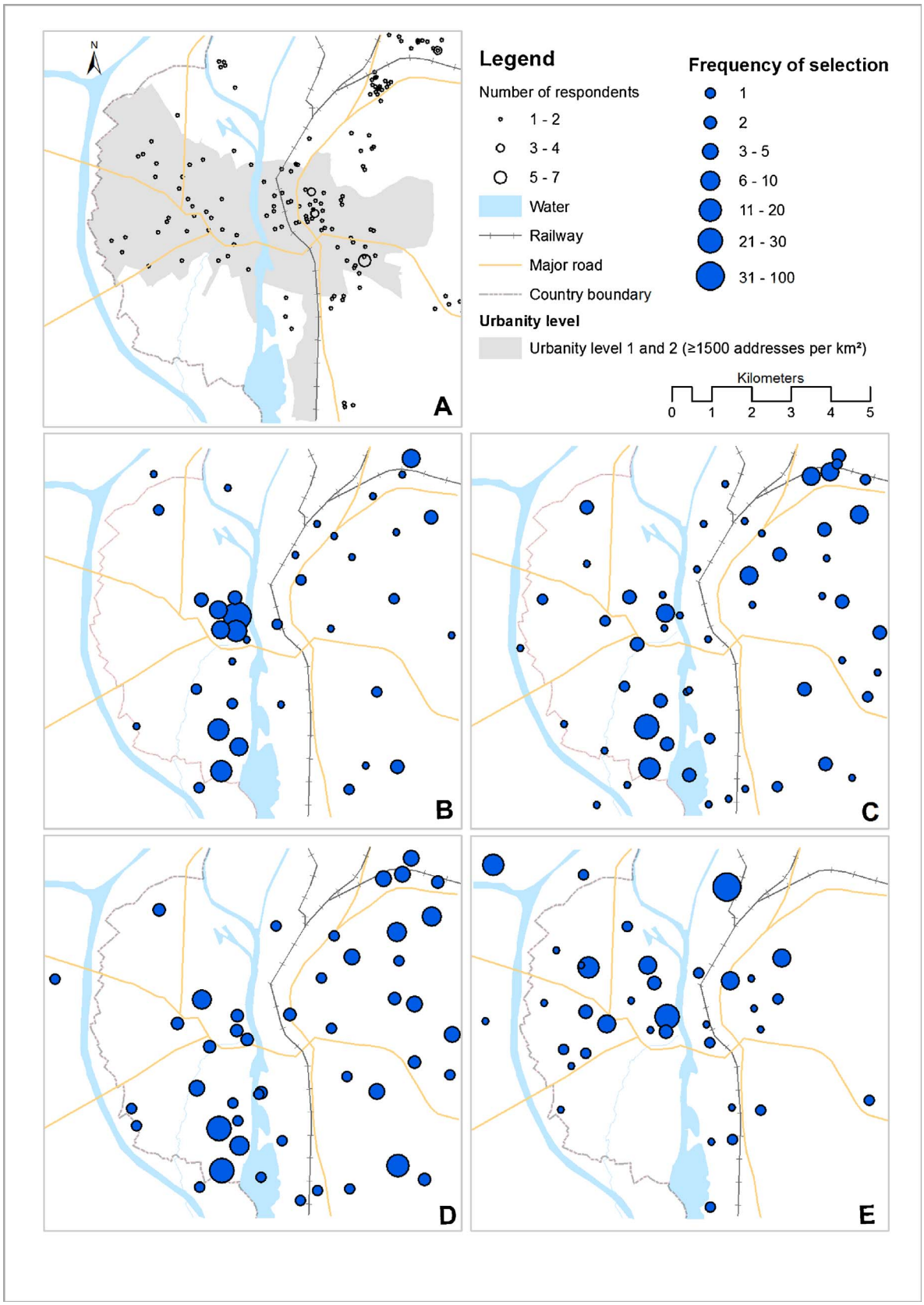

Fig. 3. The distribution of respondent' residences (A), and the frequency of selection in each landscape unit for preferred cultural service locations: cultural heritage (B), outdoor recreation and sports (C), passive enjoyment of green landscapes (D), and most disliked place to visit (E).

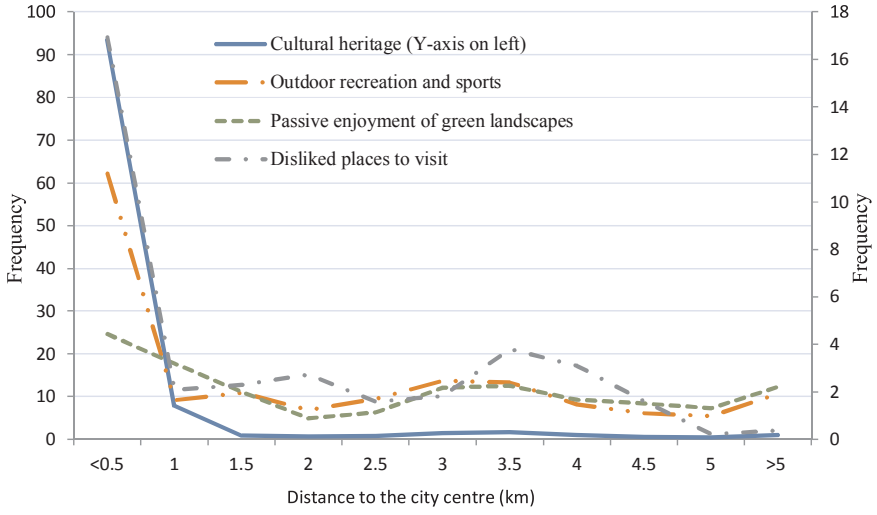

Fig. 4. Frequencies of preferred landscape units per km^2 for different cultural services in each 0.5 km interval along the urban–rural gradient. Note the different scales for the provision of cultural heritage (left) and other services (right).

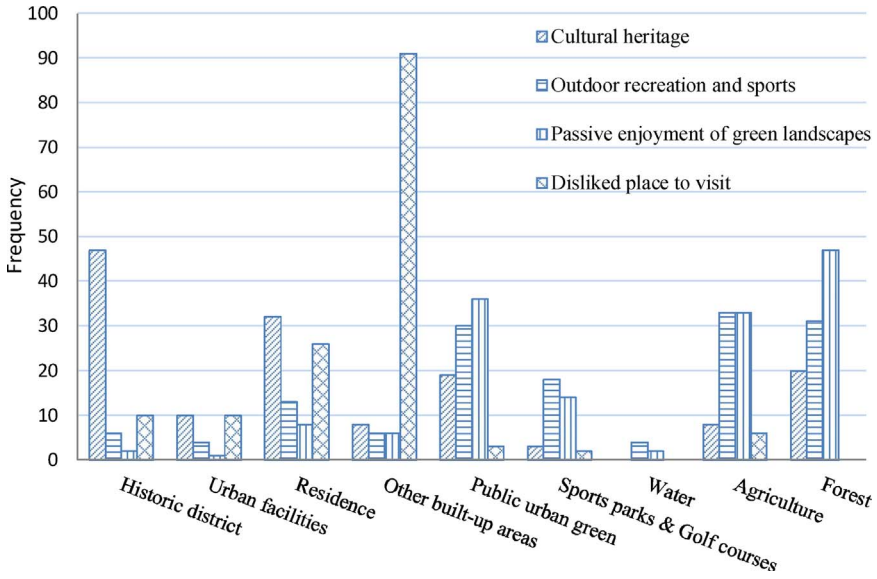

Fig. 5. Preference frequencies for cultural services in each land-use type.

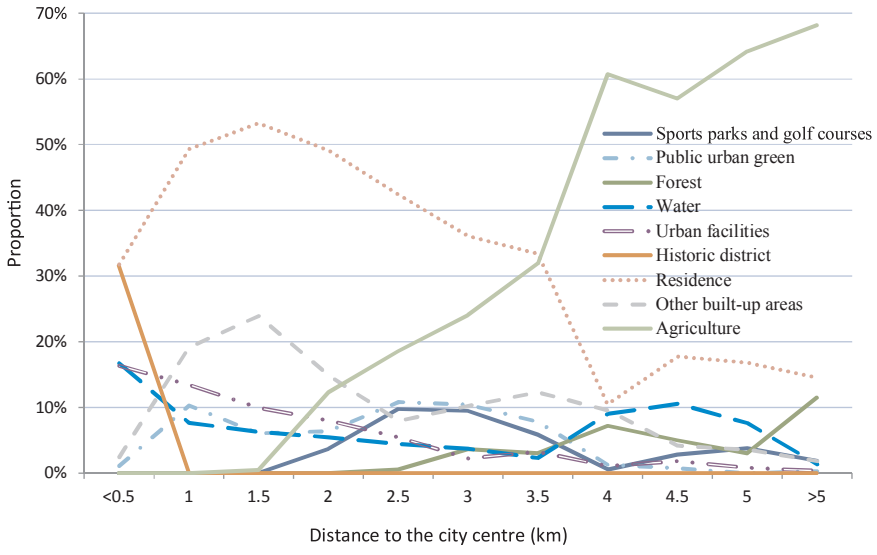

Fig. 6. Land-use composition per 0.5 km interval along the urban–rural gradient.

Table 2
Descriptive statistics of the landscape units that have been selected as the most (or least) preferred areas.

Variable	Observations	Mean	Std Dev.	Min.	Max.
Residential distance (km)	27,661	4.56	2.3	0.02	13.37
Gradient distance (km)	27,661	3.31	1.49	0	6.42
Size (km^2)	27,661	0.70	0.66	0.01	4.11
Urbanity level	27,661	0.48	0.50	0	1

The 27661 observations are acquired from the conditional logit model by multiplying 139 landscape units and 199 respondents (there are 242 respondents, while only 199 of them are with complete information for conditional logit analysis). Residential distance is the distance from their preferred landscape unit to where they live. Gradient distance is the distance from their preferred landscape unit to the city centre. Size refers to the area of the landscape unit.
Urbanity level describes the degree of concentration of human activity (living, working, education, shopping, restaurants, etc.). It is quantified based on the average number of addresses of a neighbourhood per square kilometre within a circle with one kilometre radius on January 1 of 2014. Five levels are distinguished: (1) very dense urban ≥2500 addresses per km^2; (2) dense urban 1500–2500 addresses per km^2; (3) moderately urban 1000–1500 addresses per km^2; (4) slightly urban 500–1000 addresses per km^2; (5) not urban < 500 addresses per km^2. Data source: Statistics Netherlands (CBS, 2015). In this study, urbanity level is categorized by a binary variable (1 refers to urbanity level 1 or 2, while 0 denotes other urbanity levels).

which includes land-use dummies as well as the interaction between the land-use and the gradient distance. The reference category is residential land-use. The model appears to be quite robust, since the coefficients of residential distances do not change much. As expected, the most important effect is indeed related to the gradient variable.

When looking at the land-use dummies and their impacts on the preferences, it appears that the historic centre is preferred for all three cultural services, including passive enjoyment of green landscapes. However, at the same time, it is the only land-use type that is significantly more often disliked than residential areas (the reference category). For enjoying cultural heritage, urban facilities are also appreciated. As expected, all the four green land-use types (sports parks and golf courses, public urban green, forests, and agriculture) are liked for outdoor recreation and sports and passive enjoyment of green landscapes. In addition, the sizes of the coefficients are similar, which indicates that the residents may use them interchangeably.

Overall, areas that are located on the rural side of the gradient are preferred over the ones on the urban side. However, when we look at the interaction of the land-use type with the observed gradient distance we find that certain land-use types are more preferred when they are located closer to the city centre. Interestingly, for all three types of cultural services, agricultural land and forest as well as public urban green are more appreciated when located closer to the city-centre. In addition, urban facilities closer to the city centre are important with respect to cultural heritage appreciation.

We also considered how personal characteristics e.g. age, gender and urbanity level, determine preferences for certain landscape units. It appears that, particularly for cultural heritage, older residents prefer the areas at the rural end of the gradient. On the other hand, males are less inclined than females to like areas further away from the city centre for enjoying outdoor recreation and sports. In addition, all else equal, people who live in higher density neighbourhoods have a stronger preference for landscape units positioned at the urban end, while people who live in low density neighbourhoods prefer units at the rural end for all three services.

Interestingly, opinions are found to differ between individuals, as is apparent for the historic centre. This location adds to the probability of being preferred for all three cultural services but also of being the most disliked place to visit by residents. Apparently, as with larger areas, it is the location that evokes strong feelings: people either like it or dislike it.

4. Discussion

4.1. Incorporating the urban–rural gradient in valuing cultural services

Our study shows that it is relevant and important to consider the urban–rural gradient distance when valuing people's preferences for cultural services. Often, only residential distance is taken into account,

Table 3
Selected results from the conditional logit model explaining the probability that a landscape unit gets selected as the most preferred area for the three types of cultural services or as the most disliked area.

	Basic model				Extended model			
	CH	RS	GL	DK	CH	RS	GL	DK
Residential distance (km)	−0.136*	−0.239**	−0.167**	−0.253**		−0.200**	−0.144**	−0.152**
Gradient distance (km)	−0.629**	0.161**	0.248**	−0.465**		0.528*	0.653*	
Size (km^2)	0.397*	0.486**	0.466**	1.538**	0.981**	1.306**	1.300**	2.170**
Netherlands (1 = yes, 0 = no)			3.367**	1.416**			3.161**	
Sports parks and golf courses						3.691**	3.548**	
Public urban green						3.025**	5.210**	
Forest						4.167**	4.849**	
Water								
Urban facilities					3.278**			
Historic centre					3.565**	4.017**	4.216**	3.690**
Other built-up area								
Agriculture						3.132**	3.195**	
Gradient distance # sports parks and golf courses						−0.509*		
Gradient distance # public urban green							−0.921**	
Gradient distance # forests						−0.584*	−0.572*	
Gradient distance # water								
Gradient distance # urban facilities					−3.237**			
Gradient distance # other built-up area								
Gradient distance # agriculture					−0.834*	−0.839**	−0.775**	
Gradient distance # age					0.067**			
Gradient distance # gender						−0.295*		
Gradient distance # urbanity (1 = 1,2; 0 = 3,4,5)					−0.445**	−0.411**	−0.311*	
Pseudo R^2	0.104	0.071	0.064	0.138	0.302	0.156	0.176	0.417

Note: ** 1% significance level, * 5% significance level (Only the variables with significant effect are shown, the full results are listed in Appendix B in Supplementary Material). CH: cultural heritage, RS: outdoor recreation and sports, GL: passive enjoyment of green landscapes, DK: disliked place.

but we find that the position on the urban–rural gradient (all else equal) matters as well.

Several of our findings are in line with studies that focus on one or more similar aspects. Langemeyer et al. (2014) and van Leeuwen et al. (2013) underline the importance of the city centre for the appreciation of cultural heritage services in Barcelona and Amsterdam respectively. In addition, Cho et al. (2008), Fleischer and Tsur (2000) and Neuvonen et al. (2007) emphasise the importance of the rural end for recreation and aesthetic purposes. However, these studies only looked at one end of the gradient. To the best of our knowledge, there are few other studies that also found a divergent spatial trend for the appreciation of cultural heritage compared to outdoor recreation and sports as well as passive enjoyment of green landscapes along the urban–rural gradient. One of the examples is in the Greater Manchester, there exists an increasing trend in preferences for aesthetic and spiritual services, while recreation is declining from the urban to rural end of the gradient (Radford and James, 2013).

4.2. Spatial preference patterns

The spatial gradient approach that we use adds to the literature about heterogeneity of landscape functions, as well as the idiosyncratic preferences of her users (de Vries et al., 2007). We show how, along the urban–rural gradient, the preferences for cultural heritage decline sharply from a peak in the city centre; while the outdoor recreation and sports and passive enjoyment of green landscapes show a slight decrease and then increase from the centre outwards. These spatial patterns have also been described as “concentric ring gradient pattern” in studies conducted by Hou et al. (2015) and Solon (2009). Our results emphasise the potential complexity of urban–rural gradients caused by the interactions between various anthropogenic factors and environmental elements for landscape management (McDonnell and Pickett, 2013). Using an urban–rural gradient approach can help determining whether cultural services of landscapes strengthen or weaken each other, and whether policy makers should take into account their synergies or make a trade-off.

In the case of Maastricht, the similar gradient pattern of outdoor recreation and sports and passive enjoyment of green landscapes comes as no surprise. Both services are associated with green spaces such as forests, agricultural areas, and urban green. As such, these areas can be considered as offering synergetic services (Buchel and Frantzeskaki, 2015; Radford and James, 2013). This implies that investments in either type of landscape can be beneficial to the other as well. When deciding on the specific location of e.g. public transport or food services the distance to both should be optimized.

Furthermore, our results indicate that the areas adjacent to the city centre are appreciated for all three cultural services. These urban fringe lands are valuable in conserving and enhancing vital cultural services in urban environments and increase the urban dwellers’ quality of life (Radford and James, 2013). It is important to encourage the protection of the historic places, monuments, former residences, landscapes with cultural heritage values for more general cultural services. Besides, it also implies that policies aimed at strengthening and preserving green open spaces should pay ample attention to areas in close vicinity to the city that may be less valuable from, for example, an ecological perspective but are important from a local residential perspective.

However, the historic centre was not only found to be the most preferred location for the three cultural services, but also the least attractive location. An explanation for this is the crowdedness of these areas (Buchel and Frantzeskaki, 2015; Hörnsten and Fredman, 2000). This highlights that the multifunctionality of the urban–rural fringe comes with complex planning and management challenges.

Finally, we found that older people in general prefer more rural cultural heritage sites. In the context of the ageing Dutch population, this implies that the areas at the rural end will become more popular in the future. Additionally, the feature of nationality can be associated with preferences for certain cultural services, the sense of place and emotional attachment to the landscape discussed by Buchel and Frantzeskaki (2015) and Raymond et al. (2009) indicate heterogeneous preferences towards areas with different identities. These variations might also be found among divergent groups with different characteristics such as education and income levels (Dramstad et al., 2006; Ezebilo et al., 2013), which is a worthy consideration in landscape management.

Our map-based method is efficient in terms of fast response and locating preferred landscape units for corresponding landscape services in evaluating residents’ appreciations along the urban–rural gradient. While it should be acknowledged that, it bears the risk of misinterpretation, as it only allows respondents to select one unit for providing a specific cultural service. Because most services are not generated in isolation (Plieninger et al., 2012), some people enjoy specific cultural services simultaneously across several landscape units. Critics might stress that there is a chance element in picking a single, most preferred landscape unit. The limitation of this method is consistent with some other assessment methods (Tyrväinen, 2001), and we expect that this affects all units with similar characteristics in the same random way. Another potential measurement error can arise due to a lack of map reading skills of the respondents. In our research, the students who interviewed the residents helped to select the right areas when requested. However, future research could add an additional question to check whether the respondent points out the area he/she has in mind.

5. Conclusion

The aim of this study is to improve the understanding of individual preferences for landscapes that provide cultural services, in particular cultural heritage, outdoor sports and recreation and the enjoyment of green landscapes. We obtained new insights by explicitly taking into account the position of a landscape unit on the urban–rural gradient in exploring and explaining the preference of residents. It appears that the residents’ preferences for cultural services are not scattered randomly but rather occur in particular patterns. Overall, we conclude that people prefer landscapes for the provision of recreational and aesthetic (enjoyment of green) services at the rural end of the gradient. Even when we control for distance to and the urbanity level of the place of residence, this result persists.

Furthermore, additional variables show interesting heterogeneity in the results. First of all, the historic city centre is appreciated for all three landscape services. Secondly, land-use types that can be considered to be typically rural (forest and agricultural areas) are stronger preferred at the urban end of the gradient. This may indicate a preference for heterogeneous landscapes (so-called love of variety), as more human activities interact in close vicinity to the city, there are more variations in structures, components, and elements than in the larger open spaces often found in rural areas (Cadenasso et al., 2007; Mcdonnell and Pickett, 1990).

The focus on the urban–rural gradient presents the preferences for each cultural service in a spatial context and provides insights for optimizing and integrating different services based on their respective gradient position. We recommend policymakers and planners not to ignore the importance of the urban–rural gradient distance in landscape valuation.

Moreover, this gradient approach enables further investigations on specific geographic and social-economic factors to recognize the appreciations for services. Our result recognizes how the land-use type as well as age, gender and the characteristics of the place of residence of the respondents influences their preferences for specific cultural services closer or further away from the city centre. But other factors may play an important role as well, both related to landscape characteristics as socio-economic characteristic of the area and the respondent (Vizzari et al., 2015). For example, season and reason of visiting, income level

and stewardship may be relevant (Bertram and Rehdanz, 2014; Ezebilo et al., 2013; Garrod et al., 2014). In addition, we recommend future studies to delve into the effects of immigration and ageing on the preferences for different types of landscapes.

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Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at http://dx.doi.org/10.1016/j.ufug.2017.11.011.

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